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Simms' Equatoreal, No. II., and Lee Equatoreal: Aperture 6 inches.
Observer: W. G. Thackeray.

Neither the Sun nor *Mercury* was visible, on account of the clouds, till about ten minutes after the time of ingress. On looking at *Mercury* through the telescope used by Mr. Dunkin it had a uniformly dark appearance, but after a minute or two I saw a confused patch of light in the middle of the planet, which appeared to vary in size and brightness according as the Sun was more or less obscured by clouds, and left me under the impression that the light was due to contrast. I afterwards looked through the telescope used by Captain Browne (Lee Equatoreal); *Mercury* then appeared of a uniformly dark colour, but by this time the clouds had become much thicker, and the Sun's limb was very faint. When the Sun was no longer visible *Mercury* could be seen in the telescope, and then the centre appeared the darkest.

Detached Telescope, Simms No. I.: Aperture 6 inches.
Observer: W. C. Nash.

No observations made at ingress. Sky cloudy.

About $3^h\ 28^m$ *Mercury* was seen on the Sun's disk, and for a time afterwards.

With telescope, Simms No. I., using powers 145 and 240, I carefully examined the planet, but could detect no signs of a ring surrounding it, or of a bright spot upon its disk.

Later on, I examined *Mercury* under favourable circumstances with the Lee Equatoreal, but could not detect a bright spot.

With the photoheliograph three photographs were obtained by Mr. Maunder on wet plates, which seem to show some traces of a bright halo round *Mercury*. A number of dry plates had been prepared by the tea process, but there was no opportunity for exposing them.

Royal Observatory, Greenwich,
1878, *May* 8.

Other Observations of the Transit of Mercury, May 6, 1878.

Mr. Brett writes:—

"A part of the transit was observed by me, and by Mr. Walter Pye, and by my assistant observer, at my Observatory near Putney.

"The contacts were hidden by an impenetrable mist.

"The planet was first seen after it had passed within the Sun's

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limb a distance nearly equal to its own diameter; and from that time until 3^{h} 45^{m} G.M.T. it was frequently seen at intervals through a film of cloud more or less dense, but which served very well the purpose of a dark glass.

"The planet appeared as a black disk surrounded by a ring of bright light. When the clouds thickened of course both were hidden, but the black disk never for a moment appeared without the ring of bright light.

"My impression at the first appearance was that the width of the ring was equal to a third of the diameter of the black disk. I immediately expressed that as my opinion, and it was echoed by Mr. Walter Pye, who was observing with another telescope, but he added that at the first appearance it was not round; and he afterwards explained that the bright ring was not concentric with the black disk; the ring being narrower on the side next the Sun's limb. When the next break in the clouds occurred this eccentricity was not seen. We continued to have good views of the planet and the ring during half an hour, definition being perfectly sharp; the cloud usually enabling us to dispense with the dark glass; and at all times when the disk of *Mercury* was visible the bright ring was conspicuous. My assistant observer, whose eye is both keen and well trained, confirmed me in this.

"We were obliged to use a very low power on account of the clouds. Mr. Pye had a power of 50 on my 3-inch Cooke, whilst I employed rather less on the 4-inch Cooke Equatoreal belonging to the Society."

Mr. G. F. Chambers, at his Observatory, Northfield, Eastbourne, Sussex, writes:—

"About half an hour before sunset the Sun appeared through the clouds for some ten minutes, and I was enabled to get a few glimpses of the planet. I could detect no indications of a spot, but a ring was visible round the planet. The breadth of it was slightly more than the diameter of the planet, but I had no chance of making any measures. My wife, whose vision is very acute, described it as a dark ring, but I am unable to feel quite sure whether it ought to be described as bright or dark.

"I will only add that I used a refracting telescope of 4 inches aperture and a power of 60."

Mr. Cole writes:—

"I send the following notes (for what they are worth) of the ingress, as seen at Sutton (Surrey) by myself and others.

		External Contact.	Internal Contact.
		h m s	h m s
J. J. Cole.	Refractor: Aperture $6\frac{1}{4}''$, reduced to $2''$; diagonal eye-piece.	3 12 0 (estimated from half on limb 13^{m} 15^{s}).	3 14 30

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		External Contact.			Internal Contact.		
		h	m	s	h	m	s
R. L. Cole.	Refractor: Aperture $3\frac{1}{4}$ in., reduced to $1\frac{1}{2}''$; image on screen.	3	12	9	3	14	30
A. W. Bawtree ($\frac{1}{3}$ of mile away).	Refractor: Full aperture $3''$; image on screen.	3	12	18	3	14	30

"The Sun became nearly clear at $3^h\ 5^m$, and remained so without obvious cloud until $3^h\ 25^m$. After that the planet was not seen on the disk.

"The definition during ingress was very good. There was not any black drop or 'stickiness' between the limb and the planet that I myself could detect. Our time was probably correct to a few seconds."

Mr. Penrose, at Colebyfield, Wimbledon, writes:—

"The sky was very thick until a few minutes before the predicted ingress. Then there seemed some hope of an opening, and a 'ghost' of the Sun appeared. Fearing, however, want of distinctness if I used the reflecting solar eye-piece which I had prepared, I changed it for a direct positive eye-piece magnifying 75. Focus rather roughly got; still, I had a tolerable definition. The sky cleared very much, and towards the time of internal contact the Sun's heat slightly scarred the grey glass screen I was using. The time observations are given on another page. After these were taken I replaced the solar eye-piece, using a magnifying power of 110; and both I and another observer saw a flickering spot of light on the planet's disk. To me it appeared about one-fifth of the planet's diameter above the centre, that is, in the direction of the Sun's centre. I consider it to be an optical effect entirely.

"The definition was good until about 15 min. after ingress, after which nothing could be observed.

	°	′	″	
Latitude	51	24	57	N.
	h	m	s	
Longitude	0	0	55·2	W.

"Tube and object-glass by Steinheil. Mounting and clock by Troughton and Simms.

Aperture	$5\frac{1}{4}$ in.
Focal length	83 in.

"Time by a watch compared before and after the observations with a sidereal clock by Aldridge; rate, $+0^s.5$ per diem, as ascertained by good meridian observations of stars on the evening of May 4, and of ♀ on the mornings of the 5th and 7th, civil reckoning. Two assistants were engaged in recording the time, one watching the minutes and seconds, the other writing down the times called for.

"The times here given are reduced G.M.T.

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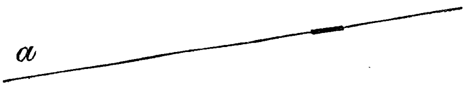
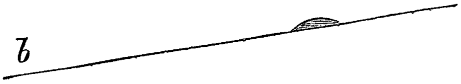
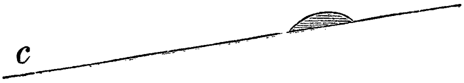
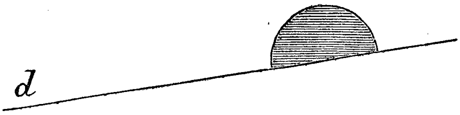
May 6, 1878, 3^{h} +

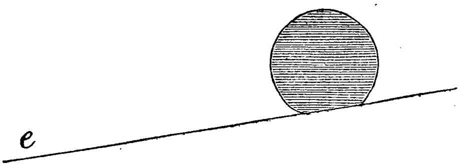
m	s		
11	3·5	*a*	Suspected dark bar on ☉'s limb very uncertain; scud ensued for a short time; the trace then lost.
12	4·5	*b*	Strongly defined notch on ☉'s limb.
12	13·5	*c*	Notch seemed to have doubled its area.
12	49·5	*d*	Apparent bisection of planet.
14	1·5	*e*	The area of the excluded segment seemed equal to that of the notch first seen.
14	31·5	*f*	Planet apparently circular, but clinging to limb.
14	35·5	*g*	Two thin threads of light seemed to stream between ☿ and ☉'s limb.
17	54·5	*h*	Estimated distance from limb = diameter of planet.

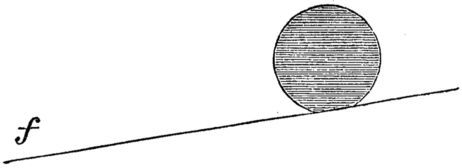


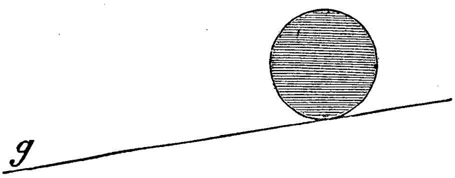


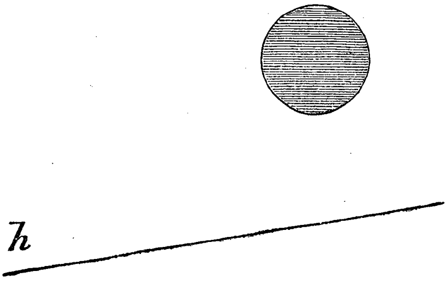












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"From phases *b*, *c*, and *e*, I should deduce external contact at about $3^h\ 11^m{\cdot}35$. The phase *d*, making allowance for irradiation, is not inconsistent with this deduction."

Mr. Prince, at his Observatory, Crowborough, Tunbridge Wells, writes:—

"The first gleams of sunshine, since the early morning, occurred at $3^h\ 5^m$, $3^h\ 8^m$, and $3^h\ 10^m$ respectively. At the latter time external contact had *not* happened, and it was most unfortunate that at this moment heavy clouds came up from S.E. and totally obscured the Sun till $5^h\ 49^m$; but from this time till $6^h\ 25^m$ I had the opportunity, during intervals of a few seconds' duration, of noting down the following observations:—

"In the first place I found the atmosphere in such a disturbed and tremulous condition that any micrometrical measures were out of the question. The limb of the planet frequently resembled a slowly revolving cogged wheel. During moments of best definition, with a power of 90 within a Dawes eye-piece, having a half-inch diaphragm and a tinted wedge, a diffused greyish patch was visible *about* the centre of the planet (it was absolutely impossible to estimate its position more precisely, on account of the great atmospheric tremor); but upon changing the power to one of 250 the patch was no longer visible, and the planetary disk was uniformly dark throughout; upon returning, however, to the power of 90 it was again visible. An aureola of light, a little brighter than that of the Sun's disk, surrounded the planet. Its breadth varied from about six seconds when the Sun was partially obscured by drifting scud to about four seconds when it was free from cloud. The periphery of this ring was not well defined; but this, again, might have been due to atmospheric tremor. It had not the slightest trace of colour. My equatoreal telescope, late Dr. Pearson's, and made by the elder Tully (see *Memoirs of Royal Astronomical Society*, Vol. ii., p. 507), is of 6·8 inches aperture and 12 feet focal length. Latitude 51° 3′ 14″ north; longitude (in time) 38 seconds east."

Prof. Pritchard, at the University Observatory, Oxford, writes:—

"The observations of this phenomenon at Oxford will, I fear, only add another instance to the list of failures in the South of England. A battery of telescopes had been prepared, including a Sun spectroscope attached to the large Grubb refractor, for the purpose of examining the progress of the appulse across the chromosphere; but dense clouds proved fatal to success so far as observation of the ingress was concerned.

"However, about 19 minutes after the commencement of the transit, a few short and partial breaks in the clouds occurred, and during three very short intervals *Mercury* was steadily viewed in the De la Rue reflector of 13 inches aperture. The metallic plane speculum had been removed from the instrument, and its

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place supplied by a first surface reflection from a large Herschelian prism. A Dawes eye-piece was attached, with a diaphragm of ·3 inch, power 120, and the result was a calm and beautifully defined image of the planet on the Sun. During two of the glimpses, I entertained no doubt that the centre of the planetary disk was very decidedly brighter than the rest of the planet; but during the third and briefest glimpse I failed to detect the phenomenon. There was no aureola discernible round the limb of the planet. The appearance of conspicuous brightness near the centre was confirmed by Mr. Jenkins, one of our very intelligent assistants; but nevertheless, owing to the brief intervals during which the Sun was even partially unobscured, and the consequent impossibility of making further experiments, I should hesitate to affirm that the bright spot in question originated in actual physical conditions of the planet itself. I may add that the general appearance of the planet on the Sun's disk was by no means so decidedly black as I had anticipated, a remark which also occurred independently to Mr. Jenkins.

"*May* 8, 1878."

Mr. Proctor, observing at Clapham, writes:—

"The weather was altogether unfavourable for observations intended to assist in the interpretation of optical or physical phenomena presented by *Mercury*. About half an hour before ingress the sky was altogether clouded and rain was falling. Shortly after, the Sun could be occasionally seen through haze between the heavier clouds. For a second or two during egress a view was obtained of *Mercury*, rather more than half immersed, but the glimpse was too brief for any peculiarity of figure to be recognised, supposing any then existed. About $3^h\ 21^m$ the sky cleared about the Sun's place, but the aspect of the north-eastern sky showed that the opportunities for observing *Mercury* would be brief and imperfect. At this time I was using a Kellner, power about 120, with the two-prism solar eye-piece and Barlow lens. Later I used, for a very short time, a Browning C eye-piece with the same solar eye-piece. Throughout I used the full aperture (8½ inches) of my Browning-With reflector. At first the weakest darkening glass was required, but later the haze thickened so much that no darkening glass was wanted to protect the eye. During the few moments, however, in which I used the C eye-piece the neutral tint glass was added. Despite considerable motion in the upper air, and apart, of course, from transient effects of haze &c., definition was excellent.

"*Mercury* appeared as a uniformly dark disk, except near the centre, where there was a whitish spot of sensible magnitude, and brightest in the middle. It seemed very nearly as bright there as the general surface of the Sun; but I have no doubt that its apparent brightness was in part due to contrast with the blackness of the disk of *Mercury*.

"I now paid special attention to the bright ring; but I may

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as well complete the account of all I was able to notice about the bright point.

"First, it was quite as distinct when the solar image faded in lustre as when that image was brightest. But when any of the small scudding clouds, while darkening the greater part of the solar disk, left the image of *Mercury* unaltered, the spot grew perceptibly fainter. I was not looking for this, and attach therefore the more importance to it. The first time it happened I thought I must have been mistaken; but I afterwards noticed it unmistakably three several times. As the spot recovered its brightness it seemed three-cornered. But the change was too rapid for me to be certain about this; and when the Sun's image was steadily seen no triangularity could be recognised in the spot.

"I could not detect any displacement of the spot from the centre of *Mercury's* disk with the low power employed. Later, when I used the C eye-piece, I only had time to notice that the spot was very much fainter than with the Kellner. I was sliding out the neutral tint graduated glass to observe the spot better, when clouds covered the Sun, which was only seen during two momentary glimpses thereafter.

"I have no doubt whatever that the spot is a merely optical phenomenon. I may note that I could perceive no change in the appearance of the spot when the telescope was released from the driving clock, and *Mercury* allowed to approach the edge of the field.

"Around *Mercury* there seemed to be a ring brighter than the Sun's surface. But I am inclined to suspect that the completeness of this ring is an optical illusion. When I directed my attention to the side of *Mercury* remotest from the Sun's limb, I could not detect any trace of a bright ring, though I could see with perfect distinctness the darkening towards the well-defined limb of the planet. On the other hand, when my attention was directed to the side of *Mercury* nearest to the Sun's limb, the bright ring was very obvious and appeared to surround the whole disk. I feel satisfied that if the half of *Mercury's* disk nearest to the edge had been kept out of view, no bright arc would have been seen round the remaining half, but I had no time to try the experiment. I could detect no trace of colour in the dark part of the ring next to the planet's disk. But the day was very unfavourable for detecting colour. The disk of *Mercury* itself did not appear black, but only of a very dark grey, owing to the bright haze over the Sun.

"The bright ring seemed very fine, a mere thread; but its distance from the limb of *Mercury* was equal to nearly or quite one-third of the planet's diameter.

"Beyond noting that the ring could be well seen with the C eye-piece—more distinctly, in fact, than with the Kellner—I could make no observations on it with the higher power. For I had barely changed powers when the Sun disappeared—about $3^{h}\ 50^{m}$.

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Capt. Noble communicates the observations made at Antwerp by the Baron von Ertbon, and MM. de Boë and Schleusner.

The weather was favourable, and at the time of interior contact, the limb of the Sun was of an extreme sharpness such as is very rarely seen.

The interior contact was observed by

	h	m	s		h	m	s	
M. de Boë at	3	31	53·5	M. T. Observatory of	= 3	14	14·9	G M.T.
M. von Ertbon	3	31	54·5	M. de Boë	= 3	14	15·9	

No black drop nor ligament was seen: the limb of the Sun reappeared without any deformation.

The observation was thus exceptionally good. M. Schleusner was the first to recognise that a brighter aureola surrounded the planet; and that there was a bright spot on the surface of the planet. The breadth of the aureola was about equal to the radius; the bright spot had the aspect of the Sun's surface, as if this had been seen through a hole. These observations were confirmed by all the observers, with the different instruments.

β Leonis and B.A.C. 3992. By S. W. Burnham, Esq.

Admiral Smyth, in the *Cycle of Celestial Objects*, has noted a very distant companion to *β Leonis*, giving

P = 114   D = 298″.

No star was seen in this place by Powell; but in the opposite quadrant, about the same distance, he found a star of nearly the same magnitude, which he supposed was the one seen by Smyth, there being an error of 180° in the angle given above. This view is supported by the remark in the *Cycle* concerning a 7 magnitude star in the same direction at a greater distance. There is no bright star anywhere near *β* except the one in the *sp* quadrant, which is B.A.C. 3992.

Mr. George Knott, in his recently published work, gives measures of several stars in the field, including the two above referred to, and a very faint one near the place of Smyth. It is not probable that Smyth referred to this star. It is too minute, and does not answer the description in other respects. Errors of this kind are so common in the *Cycle*, and the stars themselves so unimportant, that it is hardly worth while to follow them up. Mr. Knott's measures of three stars in the field are as follows:—

	°	″	
A and B	P = 206·4	D = 282·42	1864·40.
A and E	115·4	303·50	1864·38.
A and D	201·5	1134·3	1864·37.

The last is the 7 magnitude star referred to by Smyth. Looking at *β* with the 18½-inch refractor of the Dearborn Observatory, I noted a star much nearer than any hitherto seen,